Instructor: Ajchara Aksomboon Vongsawan

The Goal:

The three-year Biology curriculum serves as a pre-requisite for Science-Math majors in preparation for entering biomedical sciences as well as other science fields.

Mathayom 4 (Secondary Grade 10): Year 1 Biology 1, 2 Mathayom 5 (Secondary Grade 11): Year 2 Biology 3, 4 Mathayom 6 (Secondary Grade 12): Year 3 Biology 5, 6

The study approach adheres to the Thai curriculum using combination of US and Singaporean textbooks with emphasis in preparing students to apply analytical thinking in the subject matter. English is the language of instruction in the English Program. Students planning to enter the biomedical field or medical field within the Thai university system are advised to read a Thai version of textbook in preparation for their entrance exam due to technical term discrepancy that may be used in Thai exams. Pre-med and biomedical science students will be expected to pay close attention to current knowledge of bioscience technology for future use at undergraduate university level.

Grade 10 (M4): Year 1 Biology 1
Semester 1: (SCI 31241) 1.5 Credits, 60 hours

Course Content Unit 1: Maintaining stability of living things Homeostasis	• Science and Biology • Structure and Function Characteristics of Living Things • Research Methodology and Ethics
Unit 2: Cell and Cellular Function	 Subunit of life: cell Cell Specialization and Structure Microscope: types and application in research studies, component and proper usage Cellular Reproduction and Inheritance: Mitosis, Meiosis
Midterm Exam	Material Covered from Units 1 and 2
Unit 3: Chemistry of Life Basic Molecules of Living Things	Organic and Inorganic molecules in the human body

	 Biomolecules that are Macromolecules: Carbohydrate, Protein, Lipid, Nucleic acid Small biomolecules such as water and ions Chemical Reactions and Processes within living cells Enzymatic reactions
Unit 4: Cellular Respiration	 Biomolecules within Cells of Living Organisms Breakdown using Aerobic and Anerobic process Biomolecule in which Cells use Energy: glucose Basic Biomolecules in Living Things Cellular Respiration
Final Exam	Material Covered from Units 3 and 4
Grade 10 (M4): Year 1 Biology 2 Semester 2: (SCI 31242) 1.5 Credits, 60 hours	
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Semester 2: (SCI 3124	2) 1.5 Credits, 60 hours

Material Covered from Units 1 and 2

Midterm Exam

Final Exam	Material Covered from Units 3 and 4
Unit 4: Evolution	 Darwin's Theory of Natural Selection Genotype Frequency Hardy-Weinberg Theory Origin of Species
Unit 3: Genetics and DNA Technology	 Errors during Gene Expression giving rise to Mutations Genomics and Biotechnology Genetic Engineering/ Recombinant DNA Technology

Grade 11 (M5): Year 2 Biology 3 Semester 1: (SCI 32241) 1.5 Credits, 60 hours

Course Content	Details
Unit 1: Structure and Function of Flowering Plants	 Structure and Function of Plant tissue Structure and Function of Root, Stem and Leaf Transpiration in Plant Transport System of water and Mineral Salt in Plants Transport of Organic Substance in Plants
Unit 2: Plant Growth and Development	Plant Hormones External Stimulus Inducing Plant Development
Midterm Exam	Material Covered from Units 1 and 2
Unit 3: Adaptations Flowering Plant use for Survival	 Life Cycle of Flowering Plant Reproduction in Flowering Plant Plant Sexual Organs Seed Germination

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Unit 4: Photosynthesis	 Importance of Photosynthesis Mechanism of Photosynthesis Photorespiration C₃ and C₄ Plants CAM Plants Factors affecting Photosynthesis
Final Exam	Material Covered from Units 3 and 4
Grade 11 (M5) Year 2: Biology 4 Semester 2: (SCI 32242) 1.5 Credits, 60 hours	
Course Content	Details
Unit 1: Respiratory System and Circulatory System	 Gas Exchange in Living Things Open and Closed Circulatory System The Structure and Function of Mammalian Heart. Human Circulatory System
Unit 2: Maintaining Homeostasis in the body	 Excretion of waste product in Unicellular Organisms, invertebrates, and vertebrates including humans Kidney Function Kidney Diseases
Midterm Exam	Material Covered from Units 1 and 2
Unit 3: Digestive System	 Digestive System in Micro-organisms Digestion System in Mammals Digestion System in Humans
Unit 4: Immune System	 Defence Mechanisms of the Body Types of Immune System Components of the Immune System Immune Deficiency

Final Exam	Material Covered from Units 3 and 4
Grade 12 (M6) Year 3 Biology 5 Semester 1: (SCI 33241) 1.5 Credits, 60 hours	
Course Content	Details
Unit 1: Animal Reproduction Animal Development and Growth	 Sexual and Asexual Reproduction Male and Female Reproductive System Spermatogenesis, Oogenesis, and Fertilization In vitro fertilization Embryogenesis
Unit 2: Nervous System	 Central Nervous System (CNS) in Vertebrates: Brain and Spinal Column (Function of Synapse within brain cells and Spinal Column) Peripheral Nervous System (PNS): Cranial and Spinal Nerves, Ganglia, and Sensory Receptors Function of Nervous System: Somatic and Automatic Sympathetic Nervous System
Midterm Exam	Material Covered from Units 1 and 2
Unit 3: Endocrine System and Ductless Glands Endocrine System and Hormones	 Endocrine System and Ductless Glands Ductless gland and hormonal production in animals Mechanism of Hormone produced from Ductless Glands/Endocrine Signaling Hormonal Balance and Regulation
Unit 4: Conservation	 Energy Transfer in Ecosystem Biomass Biogeochemical Cycles: Nitrogen, Sulfur, Phosphorus Renewable and Nonrenewable Energy Sustainability

	Environmental Problems
Unit 5: Population Growth	Population Growth: Exponential and Logistic Population Control
Final Exam	Material Covered from Units 3 and 4
Grade 12 (M6) Year 3 Biology 6 Semester 2: (SCI 33242) 1.5 Credits, 60 hours	
Course Content	Details
Unit 1: Biodiversity	 Kingdoms of Life The Origin of Life and the Cell Theory Taxonomy and Biological Classification Binomial Nomenclature
Midterm Exam	Material Covered from Unit 1
Unit 2: Muscular and Skeletal System	 Protein Filaments for muscle function Interaction of Protein Filaments for Muscle Function Muscular System in vertebrate: Skeletal, Smooth, and Cardiac Muscle
Unit 3: Animal Behavior	Mechanism of Animal Behavior Inherited Behavior Learned Behavior
Final Exam	Material Covered from Units 2 and 3
Grading and Evaluation	
Percent Allocation	Percent
Attendance and Participation	10
Assignments and Quiz	20
Experiments and Lab Report	30

Midterm	20
Finals	20
Grade	Percent
A	80-100
B+	75-79
В	70-74
C+	65-69
С	60-64
D+	55-59
D	50-54
F	Below 50

Expectations from students:

- (1) to always attend class
- (2) to critically read the assigned material before class
- (3) to enthusiastically participate in class discussions and problem-solving sessions
- (4) to diligently prepare for all exams

Study and Reading Materials

- (1) Campbell PowerPoint Lectures and uploads given in conjunction with textbooks
- (2) Textbooks
 - 2.1. Biology: A Global Approach, Global Edition, 10/E

Neil A. Campbell, University of California, Riverside

Jane B. Reece, Palo Alto, California

Lisa Urry

Michael L Cain, Bowdoin College, Brunswick, Maine

Steven A Wasserman, University of California, San Diego

Peter V Minorsky, Mercy College, Dobbs Ferry, New York

Robert B Jackson, Duke University, Durham, North Carolina

or equivalent version.

- 2.2. Biology for AP® Courses SENIOR CONTRIBUTING AUTHORS JULIANNE ZEDALIS, BISHOP'S SCHOOL JOHN EGGEBRECHT, BROOKLYN TECHNICAL HIGH SCHOOL, OpenStax©2018 Rice University.
- 2.3. New Century Elective Biology: Secondary 4,5, and 6.Hodder Education Singapore, 2019 Edition.Beverly Tay, Loo Kwok Wai, Ong Bee Hoo, and Janlin Chan
- (3) Video Clips and Scientific Readings from Journals